

W.D. Long

# DENVER

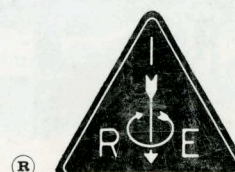
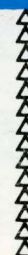
# DECEMBER



JULY 1960

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Published by the Denver Section of the IRE

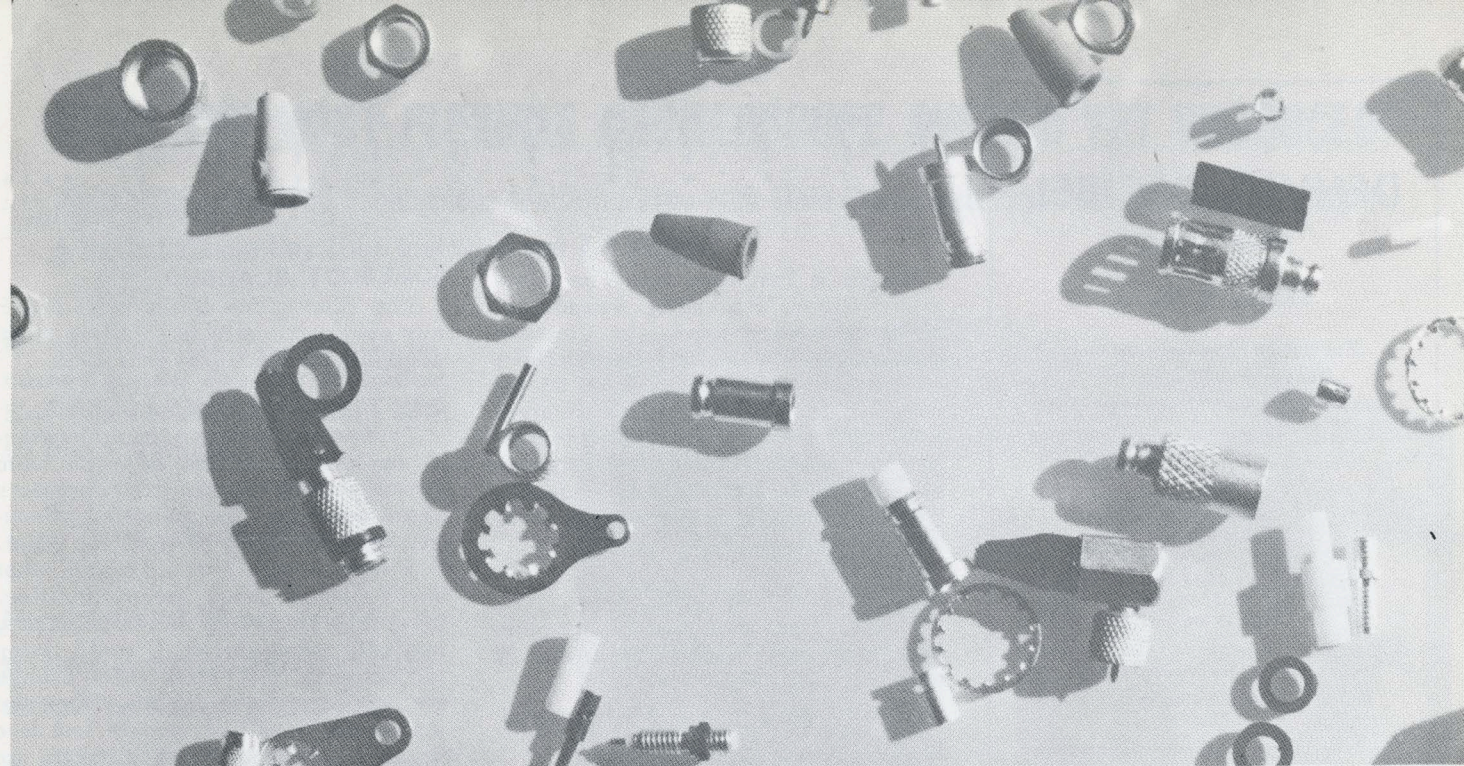


Volume V, No. 4









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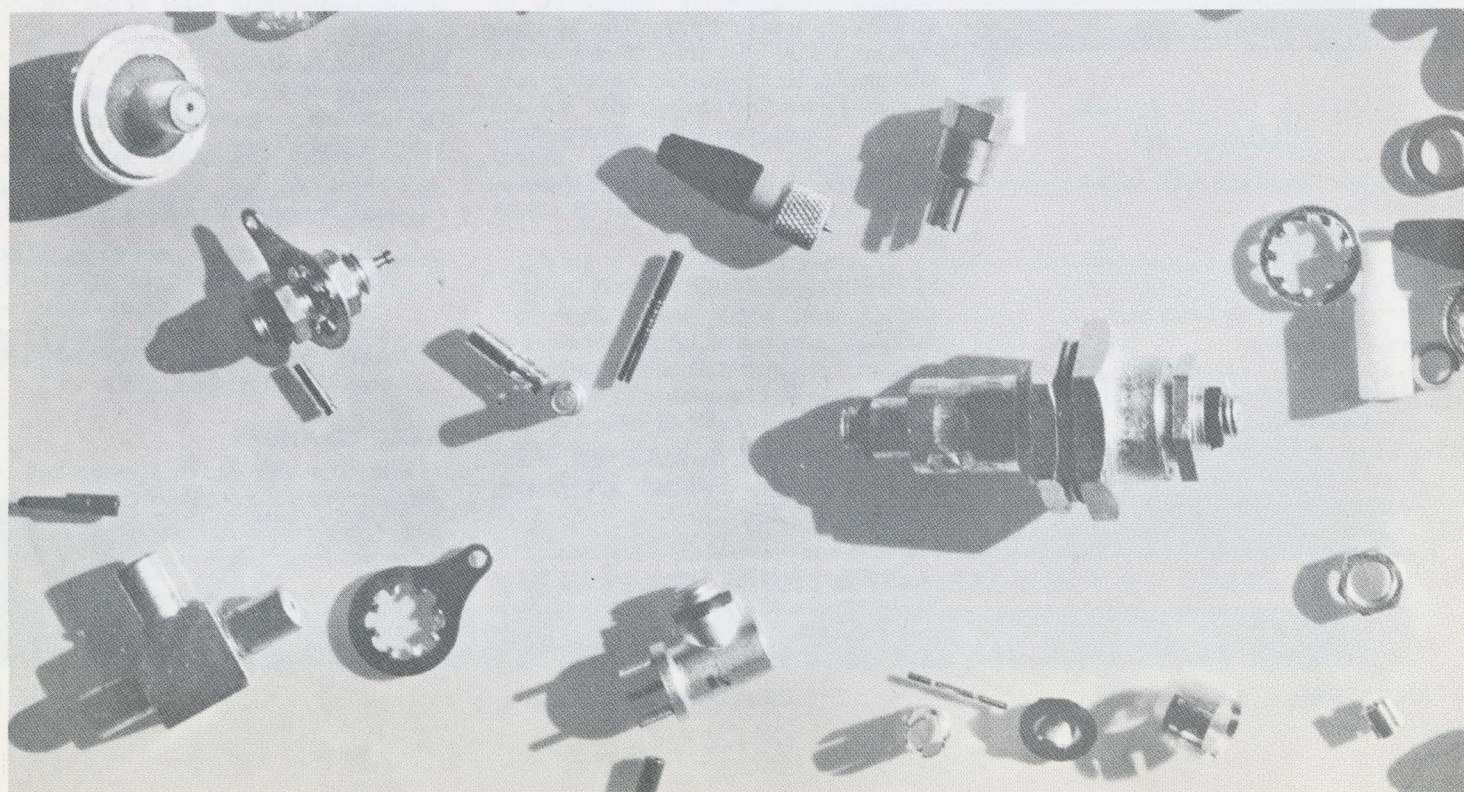
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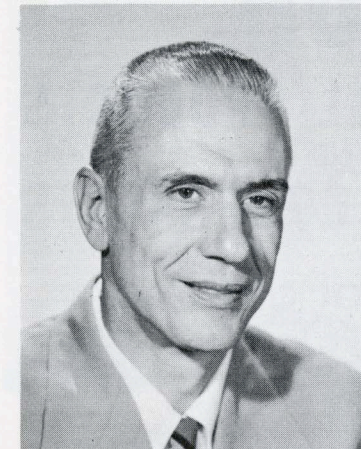
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## PGAP NEWS

By Wm. Coombs



CHAIRMAN PGAP

A meeting of the Denver-Boulder section of the Professional Group on Antennas and Propagation was held at the National Bureau of Standards on April 13, 1960. Two speakers were featured in paper presentations:

Martin T. Decker of the Boulder Laboratories presented the subject: "Television Coverage from Aircraft." Prediction of service area for airborne television stations transmitting in the environment of interfering stations was discussed. Methods of calculation were reviewed and examples of coverage maps were shown.

George W. Haydon of the Boulder Laboratories presented a discussion of "The 1959 International Radio Conference in Geneva." Emphasis was given on the inside story of experiences as a member of the U.S. delegation to the four-month conference held in Geneva last fall. The purpose of this conference was to review and revise the international regulations concerning the use of radio. World-wide agreements reached were reported by Mr. Haydon, including a discussion of such new services as radio astronomy and outer space communications.

### CALL FOR PAPERS

The I. R. E. Transactions on Human Factors in Electronics is planning to devote its March 1961 issue to the topic, "Automation of Human Functions," and manuscripts for that issue are hereby solicited.

## NOTICE OF THE MEETING OF THE PROFESSIONAL GROUP ON ANTENNAS AND PROPAGATION

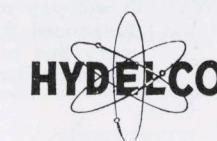
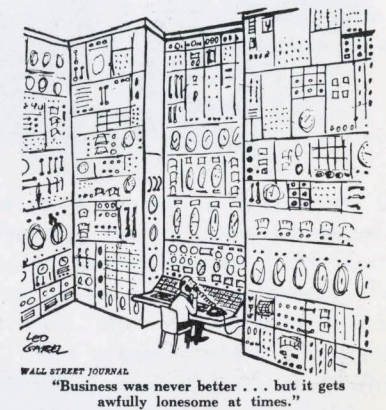
### Denver Section Of The IRE

Date: June 20, 1960  
Time: 2:00 P.M.  
Place: NBS Boulder Laboratories Auditorium, Boulder, Colo.  
Speaker: Dr. R. C. Hansen, Space Technology Laboratories, Inc., will present an illustrated lecture "Design Factors for Interplanetary Communication Systems."

The paper will discuss a number of design considerations for long-range space communication systems with emphasis on antenna and propagation factors. Methods for computing effective antenna temperature due to loss, atmospheric absorption, galactic noise, star noise, sidelobes and selective absorption will be given, and some numerical examples discussed. In addition, atmospheric refraction, absorption, and Faraday rotation will be discussed. The design trade-offs between vehicle stabilization and different

types of antenna systems will then be covered, followed by a discussion of information coding techniques and narrow band phase-lock receivers.

As an example, the design parameters and results for an interplanetary command, tracking and telemetry system will be given.



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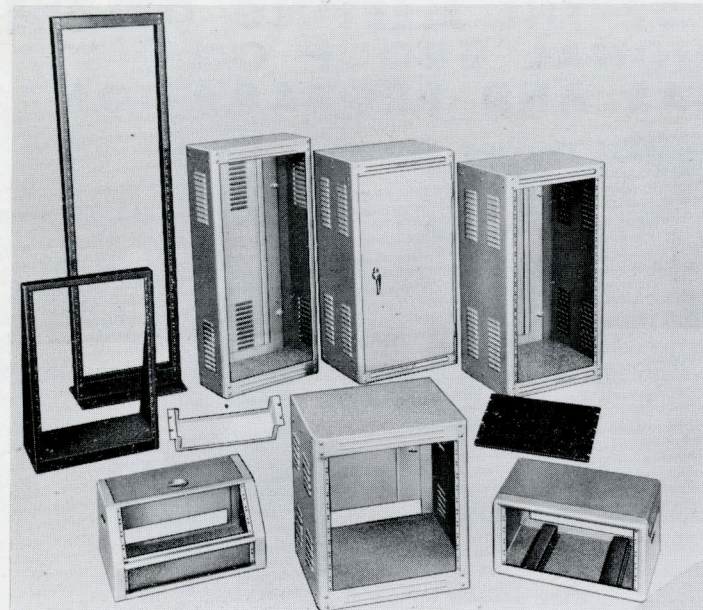
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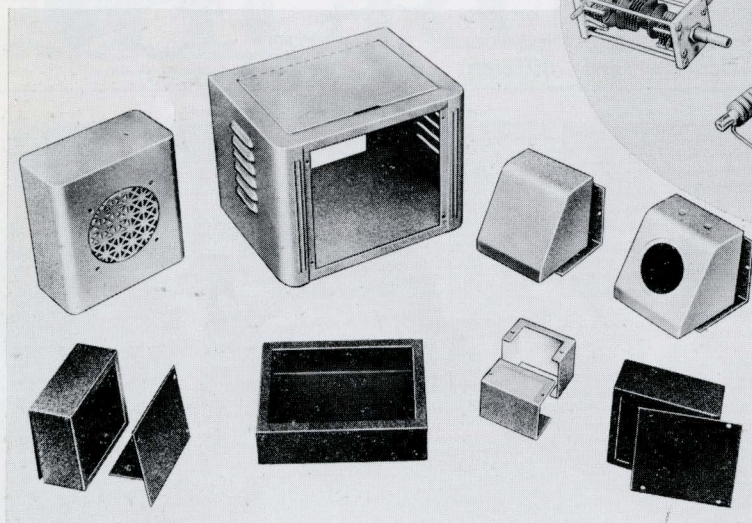
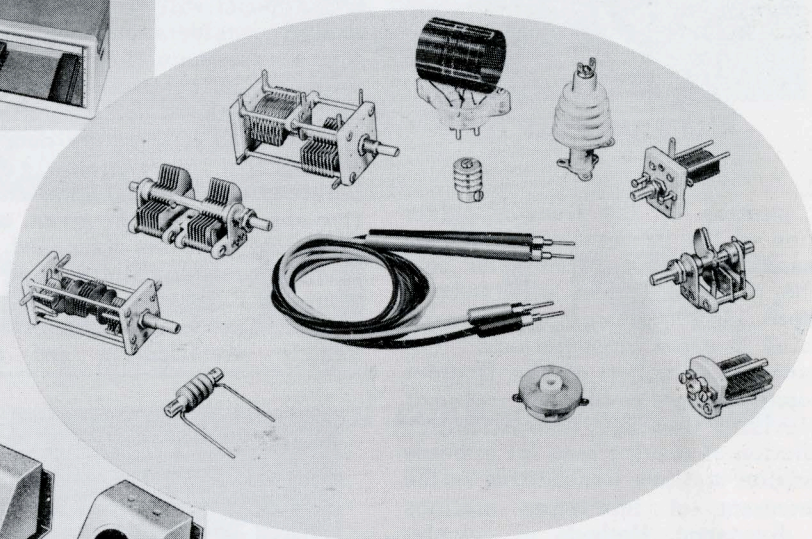
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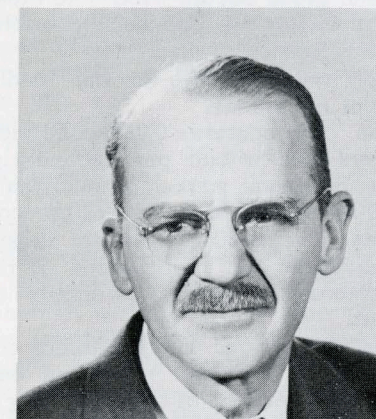


**BUD RADIO, INC.**  
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1960

**WHO'S WHO**  
 in the Section

1960



CHAIRMAN

Mr. William D. George was born in Spartanburg, South Carolina. He received his B. S. in Electrical Engineering from Georgia Institute of Technology in 1929. He participated in the NBS Graduate school both as a student and instructor. Mr. George was an engineer with NBS 1929-1946 when he was appointed Section Chief High Frequency Standards. Principle technical contributions involved standards of frequency and time and the extension

of services and accuracy of broadcasts from NBS radio stations WWV and WWVH. Since 1956, Mr. George has served as acting Chief Radio Standards Division of NBS Boulder Laboratories. He is the author of many published papers principally dealing with frequency standards and time interval. Mr. George is a member of I. R. E. and past chairman of committee 25.1 Basic Standards and Calibration Methods.



VICE CHAIRMAN

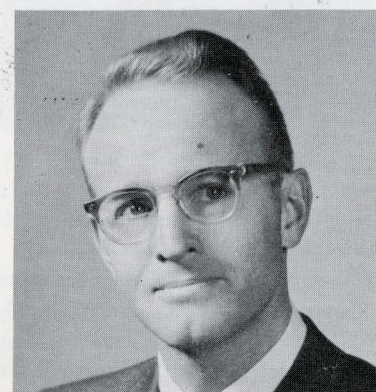
Howard S. Johnson was born in Flatbush, New York.

He started in radio engineering with KLZ in 1932 and specialized in construction, maintenance and designed studio circuitry. Mr. Johnson worked with KLZ, KOA, and left KFEL as Chief Engineer to enter Military service in 1944.

Mr. Johnson held positions with Gates Rubber Company and Dow

Chemical Company in Instrument Departments. He left Dow Chemical to come to Martin-Denver. At Martin-Denver he set up an Engineering Test Instrument and Maintenance Laboratory. His present title is Supervisor of Primary Standards Laboratory which he has held since November, 1958.

Professional organizations in which he holds active membership include I. R. E. and I. S. A.



SECRETARY-TREASURER

Jack C. Twombly received his B. S. degree in Electrical Engineering from the University of Colorado in 1944, and his M. S. from Stanford in 1950. Upon returning to the University of Colorado he conducted classified and vacuum tube research projects from 1950 to 1959. He received his Ph. D degree from the University of Colorado in 1959. Twombly is currently employed as Project Director

Engineering Experiment Station University of Colorado.

He is currently directing a project sponsored by the Office of Naval Research on the study of properties of high-charge-density electron beams. In addition to his duties at the Experiment Station he also serves as a faculty member in the Electrical Engineering Department. He is a member of the I. R. E. and A. I. E. E.



ASSISTANT SECRETARY

Fred P. Venditti was born in Pueblo, Colorado. He received his B. S. in Electrical Engineering from the University of Colorado in 1943. During his tour of military duty in the Signal Corps Mr. Venditti supervised radar installation and maintenance groups. In 1950 he was appointed a Senior Development Engineer with Motorola Inc., Chicago, Ill. While at Motorola

Mr. Venditti worked on receiver design. Denver Research Institute appointed Mr. Venditti a Research Engineer in 1954 to supervise studies in reduction of Atmospheric Noises of radio reception. In 1958 Mr. Venditti received his M. A. in mathematics from the University of Denver.

He is a member of I. R. E. and A. I. E. E.



# TIME CODE ON WWV

To properly analyze the information from a satellite — or to pinpoint its position — the radio signals received by a tracking station must be identified by the date and time of the observations. To aid in providing a standard timing technique an experimental code is now being transmitted by the National Bureau of Standards as a part of the NBS standard frequency shortwave broadcasts over station WWV.

This experimental code and broadcast was developed by a number of organizations and individuals including the Inter-Range Instrumentation Group, the National Aeronautics and Space Administration, Convair Astronautics, and NBS.

The experimental broadcast — as is true of the regular WWV transmissions — is supervised, monitored, and controlled by the Radio Broadcast Services Section of the National Bureau of Standards' Boulder Laboratories.

Herewith is described an experimental broadcast from radio station WWV (2.5, 5, 10, 15, 20 and 25 Mc) of a 36 BIT 100 PPS Time Code.

The code is broadcast for one minute intervals and 10 times per hour (Figure 4). Except at the beginning of each hour, it immediately follows the standard audio frequencies of 440 cycles per second and 600 cycles per second. The latter frequencies are given alternately as before except the duration is 2 minutes instead of 3 minutes when the code is given.

The code contains time of year information (UT) in seconds, minutes, hours, and day of year.

The code is binary coded decimal (BCD) consisting of nine binary groups each second in the following order: 2 groups for seconds, 2 groups for minutes, 2 groups for hours and 3 groups for day of year. Code digit weighting is 1-2-4-8 for each BCD group multiplied by 1, 10, or 100 as the case may be.

A complete time frame is one second. The least significant binary group and the least significant binary digit in each group occurs first. The binary groups follow the one second or time frame reference marker.

"On time" occurs at the leading edge of all pulses.

The code contains 0.1 second index markers and a one per second time frame reference marker in addition to the 100/sec clocking rate of the code pulses. The 1000 c/s carrier is synchronized to the code pulses so that millisecond resolution is easily obtained.

The 0.1 second index markers consist of "1" pulses preceding each code group except at the beginning of the time frame where it is a "0" pulse.

The one second reference marker is made up of five "1" pulses followed by a "0" pulse. The timing frame begins at the leading edge of the "0" pulse.

The code is a spaced code format, that is, a binary group (BCD) follows each 0.1 second index marker. The last index marker is followed by an

unused four bit group of "0" pulses just preceding the one-second time frame reference marker.

The unused four bit group may be used in the future to transmit other types of coded information, such as, the last digit of the year, station number, etc.

Width coding:

"0" pulse, 2 ms wide (2 cycles of 1000 c/s)

"1" pulse, 6 ms wide (6 cycles of 1000 c/s)

The time code is amplitude modulated on a 1000 c/s carrier. The carrier is coherent with the time code so that the leading edges of the time code pulses coincide with a positive going zero axis crossing of the carrier.

The code is illustrated in Figure 1 in the attached drawing and is being transmitted on a 1000 c/s carrier as shown in Figure 3. An alternative format which includes the 100/sec index markers as shown in Figure 2 is available from the time generator if desired. Time allotted to the code, on WWV, is shown in Figure 4.

## Herbstreit Nominated For Region Six Director



Jack W. Herbstreit, recipient of the Harry Diamond Memorial Award for original research and leadership in radio wave propagation and fellow in the IRE, has been nominated for director of Region Six.

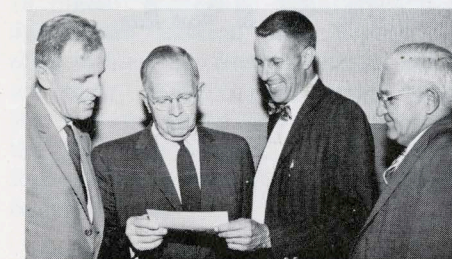
He has been with the Central Radio Propagation Laboratory of the National Bureau of Standards since 1946 and is now chief of the Tropospheric Propagation Research Section. He directed the first long-distance observations of radio scatter in the troposphere made by NBS in 1951, demonstrating the existence of useful signals at VHF and UHF television frequencies at great distances. At the moment he is deeply involved in extending the Bureau study of the possibilities of using these

frequencies for communications far beyond the horizon, heretofore considered the limit of their useful range.

He served as technical advisor to the International High-Frequency Broadcast Conference in Mexico City (1948) and was responsible for the preparation of radio propagation information used by the Conference. He served in a similar capacity in 1950 when the Second International High-Frequency Broadcast Conference was convened in Florence and Rapallo, Italy.

A native of Cincinnati, Ohio, Mr. Herbstreit received the E. E. degree from the University of Cincinnati in 1939. His co-op job while attending the University was transmitter engineer for stations WSAI, WSXAL, and the 500-kilowatt WLW in his home town. Following this he joined the Federal Communications Commission, serving in several different assignments before transferring to the Operational Research Staff, Office of the Chief Signal Officer, Department of the Army. While with this group he made numerous operational radio systems studies including measurements of atmospheric noise levels and the attenuation of radio signals by jungles in Panama and the Southwest Pacific, measurements and analyses of experimental Low Frequency Loran in the Western Hemisphere and Frequency requirements for low power radio communications and navigation equipment.

## DENVER ELECTRICAL REPS CLUB PRESENTS SCHOLARSHIP CHECK



On June 6, the Electrical Representatives Club at their regular meeting held in Denver presented a \$500 check to Mr. C. L. Eckel, retiring Dean of Engineering at the University of Colorado. The money will be used as a loan fund for deserving Junior and Senior Electrical Engineering students at the University.

Pictured above from left to right — Mr. Herb Woodard, Program Chairman of the Club, Dean C. L. Eckel, accepting the check, Mr. George Kaub, ERC President, and Mr. C. D. Belt, Loan Fund Chairman.

The Electrical Representatives Club was founded in 1953 as a non-profit group to improve and coordinate consumer-vendor relationships. The Club has grown from a small nucleus to some fifty members representing the largest electrical manufacturers in the United States.

## 1960 ELECTRON DEVICES MEETING-WASHINGTON, D. C. OCTOBER 27-28

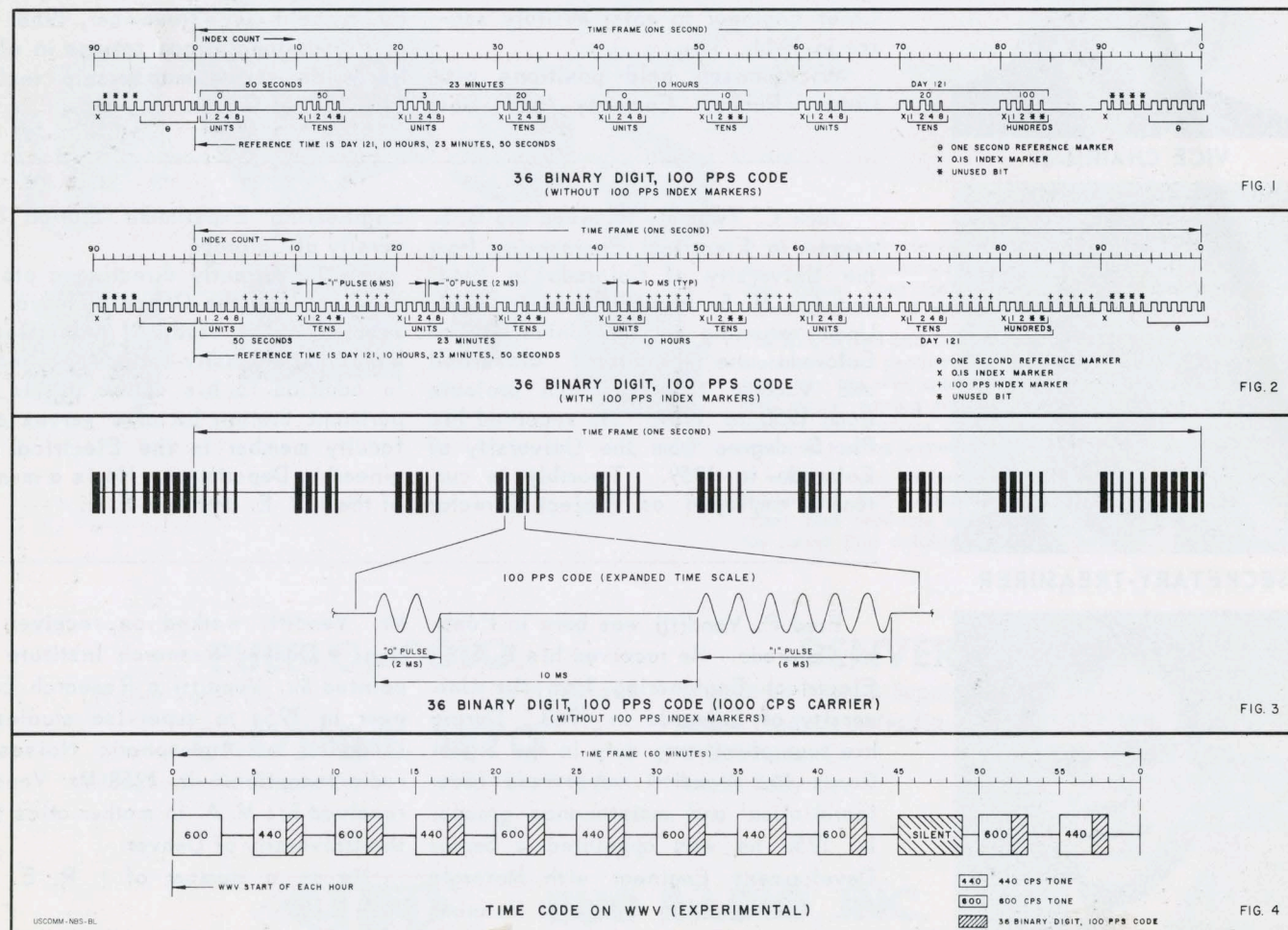
New York—The sixth annual Electron Devices Meeting will be held at the Shoreham Hotel, Washington, D.C. on October 27 and 28. Major areas of interest to be explored at the Meeting include recent advances in integrated and functional devices, new materials and techniques for fabricating conventional transistors of improved performance, and device reliability. Two days of technical sessions will be held, and special luncheon programs are being planned.

This Meeting is sponsored by the Professional Group on Electron Devices of the Institute of Radio Engineers (PGED). Chairman of the General Committee is Dr. John A. Hornbeck, Director of Electron Tube and Transistor Development, Bell Telephone Laboratories, Incorporated, Murray Hill, New Jersey.

A call for papers has been issued by the technical program chairman, Dr. H. W. Welch, Director of Research and Development at Motorola, Inc., 8201 E. McDowell Road, Phoenix, Arizona. Abstracts should be in Dr. Welch's hands by August 1.

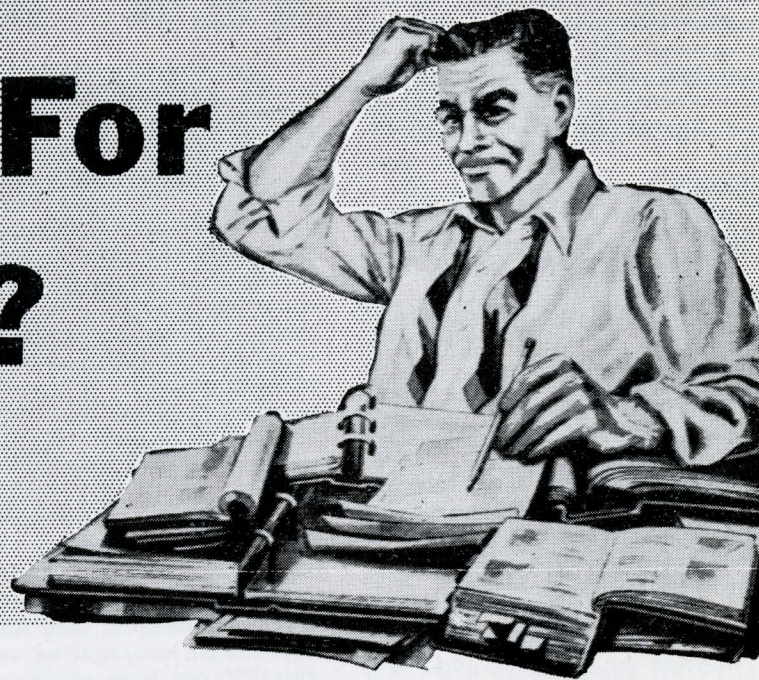
Other members of the General Committee for the Conference are Dr. C. P. Marsden, Jr., National Bureau of Standards, Local Arrangements; Dr. Earl L. Steele, National Bureau of Standards, Publications; and H. S. Renne, Bell Telephone Laboratories, Incorporated, Publicity.

The PGED is an association of members of the Institute of Radio Engineers with professional interest in the research, development, design, and application of electron tubes and solid state devices, and in scientific, technical, industrial and other activities that contribute to the field. The Group encourages close cooperation and exchange of technical information among its members.





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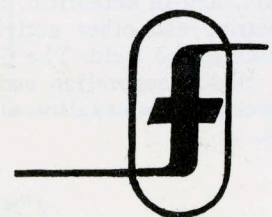
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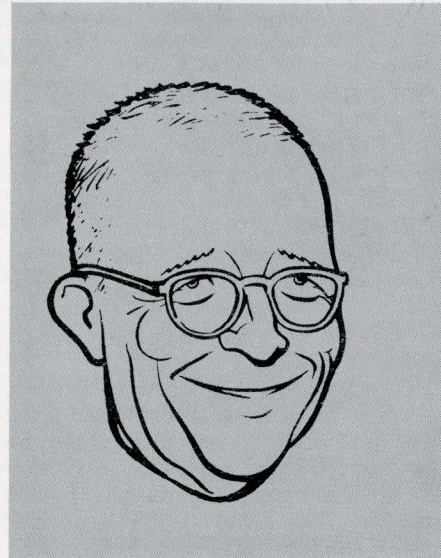
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## EDITOR'S NOTES



All members interested in forming a local chapter of Professional Group Space Electronics and Telemetry are urged to contact Mr. J. B. Craig of the Martin Co. - PY 4-5211, Extension 5211, days, or PY 4-0564, evenings.

Our associate editor, Mr. Hilleary, is in Salt Lake and reports that the Salt Lake section may accept our offer to have the Denver Decibel serve as their section publication also. Mr. Hilleary would serve as editor for the Salt Lake section. We are looking forward to receiving his continued contributions.

The "Canons of Ethics for Engineers" form an important document for various reasons, including the fact that they give guiding principles of conduct based on long experience. The wisdom accumulated from years of engineering work by many engineers is here distilled into succinct statements for the guidance of all members of the profession.

The Professional Group on Space Electronics and Telemetry will sponsor the fifth National Symposium concerning this important technological field at the Shoreham Hotel in the nation's capitol on September 19, 20 and 21. This year's Symposium will emphasize discussion of new design philosophies and advances in the state-of-the-art.

## FLOW GRAPHS FOR THE ANALYSIS OF ELECTRONIC SYSTEMS

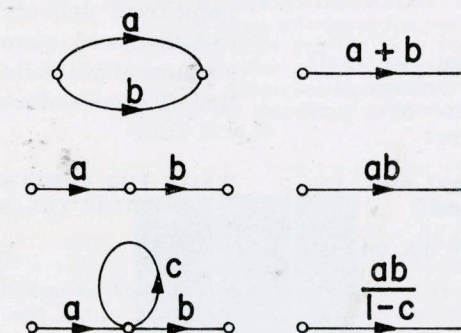
Dr. Charles S. Lorens, Supervisor, Communications Research Group, Jet Propulsion Laboratory and Chairman, Los Angeles IRE PGIT, presented a professional talk to the joint meeting of the Denver Section and PGMITT. For those unfamiliar with flow graphs, this tutorial talk described briefly simple formulation and reduction techniques for flow graphs. Figure 1 depicts simple reduction rules. Figure 2 depicts a step by step reduction and an introduction to the loop rule. Considerable interest has been generated in the past four years in this mathematical technique which is particularly applicable to the analysis of electronic systems. Figure 3 shows the application of the flow graph method to a simple transistor circuit. This method is also applicable to tube circuits as shown in figure 4. For those interested in more information on this new technique Dr. Lorens recommends the following references:

S. J. Mason - "Feedback Theory - Some Properties of Signal Flow Graphs," Proc. IRE, Sept. 1953 p. 1144.

"Feedback Theory - Further Properties of Signal Flow Graphs," Proc. IRE, July 1956 p. 920.

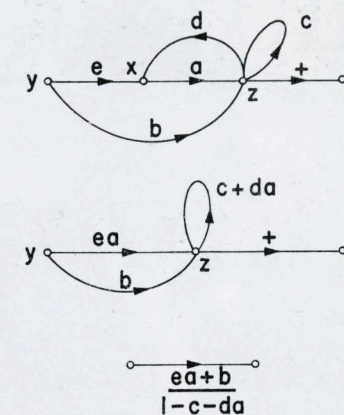
C. S. Lorens - "Theory and Applications of Flow Graphs," Research Laboratory of Electronics, MIT, TR 317, July 1956.

Mason & Zimmerman, Electronic Circuits, Signals, and Systems, Wiley 1960 ch. 4, 5.



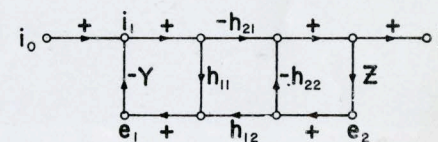
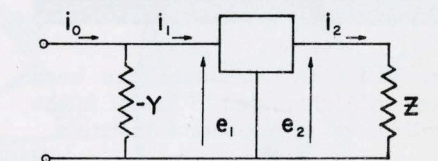
## FLOW GRAPH REDUCTION

Figure 1



## APPLICATION OF REDUCTION RULES

Figure 2

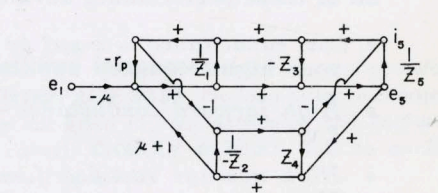
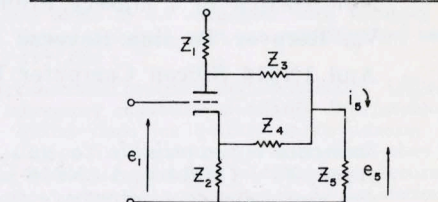


$$e_1 = h_{11} i_1 + h_{12} e_2$$

$$i_2 = -h_{21} i_1 - h_{22} e_2$$

$$\frac{i_2}{i_1} = \frac{-h_{21}}{(1+h_{11}Y)(1+h_{22}Z)-h_{12}h_{21}YZ}$$

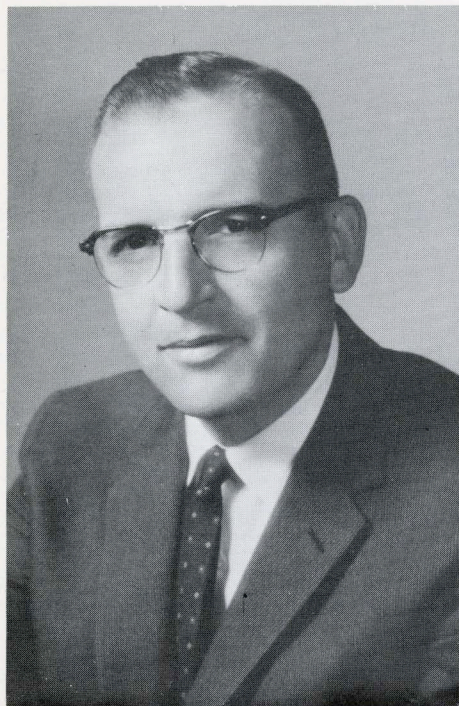
Figure 3



$$\frac{e_2}{e_1} = \frac{-\mu(Z_4 - Z_3)}{r_p + (\mu+1)(Z_3 + Z_4) - \frac{r_p(Z_3 + Z_4)}{Z_1 Z_2} - \frac{1}{Z_5} \text{ (etc)}}$$

Figure 4





Dr. Willis G. Worcester has been invited to Afghanistan to assist in the establishment of a research institute.

## DR. WORCESTER INVITED TO AFGHANISTAN

He will spend eight weeks this summer at Kabul University in Afghanistan to analyze the possibilities and needs in establishing a University Institute of Scientific Research.

Worcester has been awarded an International Educational Exchange Service grant by the U. S. Department of State to fulfill the assignment.

Widely-known for his research in vacuum tubes and aluminum foil solenoids, Worcester has supervised research activity in the College of Engineering since his appointment as executive director of the Experiment Station in 1956.

He has been instrumental in improving and increasing industrial and engineering opportunities in Colorado. As assistant dean of the CU Graduate School, a post he has held since it was created two years ago, Worcester administers all sponsored research on the Boulder campus.

The Coloradan was specifically requested by the head of Afghanistan's only university as an outgrowth of President Asghar's visit to the University of Colorado last year. Kabul

University is only about 11 years old, but it is trying to provide leadership for development of its country.

Worcester has been a member of the University of Colorado College of Engineering faculty for 14 years, including leave during 1950-52 to receive his Ph.D. and work as research associate at Stanford University.

A Colorado alumnus of 1939, Worcester earned a M. S. degree at California Institute of Technology and spent five years as an engineer with the General Electric Company.

He returned to CU as an assistant professor of electrical engineering in 1946, and was named associate professor in 1952 and professor in 1956.

Mrs. Worcester, the former Isobel Greenway, and Billy, 14, will accompany Worcester. Their itinerary will include brief stops in Los Angeles, Honolulu, Tokyo, Hong Kong, Bangkok, New Delhi and Srinagar, with arrival at Kabul in mid-June.

They plan to return to Boulder early in September via Istanbul, Athens, Rome and other European capitals, New York and Washington.

## 1961 INTERNATIONAL SOLID-STATE CIRCUITS CONFERENCE CALL FOR PAPERS

The 1961 International Solid-State Circuits Conference, the 8th annual meeting, will be held on February 15, 16, 17, 1961, on the campus of the University of Pennsylvania and the Sheraton Hotel, Philadelphia, Pa.

The conference, sponsored jointly by the Institute of Radio Engineers, American Institute of Electrical Engineers and the University of Pennsylvania, will feature papers dealing with circuit properties, circuit philosophy and design techniques related to solid-state devices in the following general areas:

Solid-state memory, storage and logic elements—such as twistors, thin-film memories and associated circuits, photoelectronic circuitry, etc.

Solid-state microwave amplifying mechanisms, such as parametric amplifiers and masers.

Solid-state devices performing an integrated circuit function.

Cryogenic digital and linear applications.

Novel types of solid-state devices—in unique modes of operation—such as those utilizing the Hall effect, high-temperature circuit elements and solid-state filters and delay lines.

Advanced circuitry—with emphasis on significant developments in the art—to the exclusion of data on equipment design.

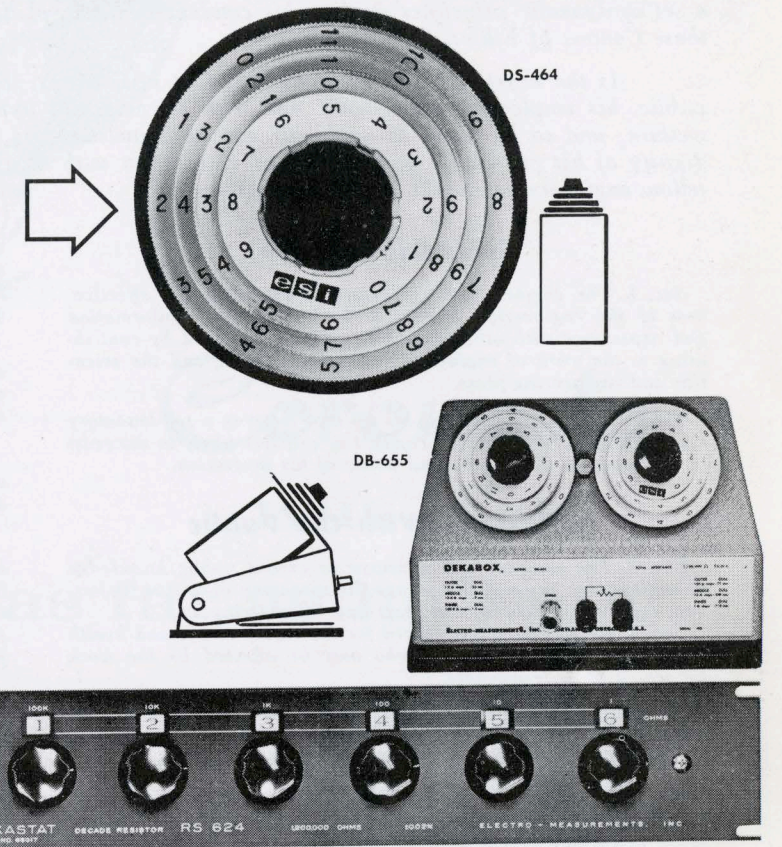
Papers representing original contributions in these and related fields are invited.

Abstracts — highlighting the nature of the contribution, its significance in the art and theoretical and experimental results — 300 to 500 words in length, which can be accompanied by key illustrations, plus 50-word summaries for advance program mailings, should be submitted in double-spaced typewritten form (and in triplicate) on or before October 14, 1960, to the program chairman:

Jerome J. Suran  
Building 3, Room 115  
General Electric Company  
Electronics Park  
Syracuse, New York

Abstracts and summaries should be accompanied by author's name, company affiliation and position title, business and home address, telephone contact and brief biographical sketch.

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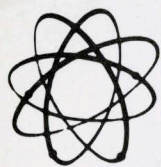


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# CANONS OF ETHICS FOR ENGINEERS

## FOREWORD

Honesty, justice, and courtesy form a moral philosophy which, associated with mutual interest among men, constitute the foundation of ethics. The engineer should recognize such a standard, not in passive observance, but as a set of dynamic principles guiding his conduct and way of life. It is his duty to practice his profession according to these Canons of Ethics.

As the keystone of professional conduct is integrity, the engineer will discharge his duties with fidelity to the public, his employers, and clients, and with fairness and impartiality to all. It is his duty to interest himself in public welfare, and to be ready to apply his special knowledge for the benefit of mankind. He should uphold the honor and dignity of his profession and also avoid association with any enterprise of questionable character. In his dealings with fellow engineers he should be fair and tolerant.

## Professional Life

Sec. 1. The engineer will co-operate in extending the effectiveness of the engineering profession by interchanging information and experience with other engineers and students and by contributing to the work of engineering societies, schools, and the scientific and engineering press.

Sec. 2. He will not advertise his work or merit in a self-laudatory manner, and he will avoid all conduct or practice likely to discredit or do injury to the dignity and honor of his profession.

## Relations With the Public

Sec. 3. The engineer will endeavor to extend public knowledge of engineering, and will discourage the spreading of untrue, unfair, and exaggerated statements regarding engineering.

Sec. 4. He will have due regard for the safety of life and health of the public and employees who may be affected by the work for which he is responsible.

Sec. 5. He will express an opinion only when it is founded on adequate knowledge and honest conviction while he is serving as a witness before a court, commission, or other tribunal.

Sec. 6. He will not issue ex parte statements, criticisms, or arguments on matters connected with public policy which are inspired or paid for by private interests, unless he indicates on whose behalf he is making the statement.

Sec. 7. He will refrain from expressing publicly an opinion on an engineering subject unless he is informed as to the facts relating thereto.

## Relations With Clients and Employers

Sec. 8. The engineer will act in professional matters for each client or employer as a faithful agent or trustee.

Sec. 9. He will act with fairness and justice between his client or employer and the contractor when dealing with contracts.

Sec. 10.—He will make his status clear to his client or employer before undertaking an engagement if he may be called upon to decide on the use of inventions, apparatus, or any other thing in which he may have a financial interest.

Sec. 11. He will guard against conditions that are dangerous or threatening to life, limb, or property on work for which he is responsible, or if he is not responsible, will promptly call such conditions to the attention of those who are responsible.

Sec. 12. He will present clearly the consequences to be expected from deviations proposed if his engineering judgement is overruled by nontechnical authority in cases where he is responsible for the technical adequacy of engineering work.

Sec. 13. He will engage, or advise his client or employer to engage, and he will co-operate with, other experts and specialists whenever the client's or employer's interests are best served by such service.

Sec. 14. He will disclose no information concerning the business affairs or technical processes of clients or employers without their consent.

Sec. 15. He will not accept compensation, financial or otherwise, from more than one interested party for the same service, or for services pertaining to the same work, without the consent of all interested parties.

Sec. 16. He will not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with his client or employer in connection with work for which he is responsible.

Sec. 17. He will not be financially interested in the bids as or of a contractor on competitive work for which he is employed as an engineer unless he has the consent of his client or employer.

Sec. 18. He will promptly disclose to his client or employer any interest in a business which may compete with or affect the business of his client or employer. He will not allow an interest in any business to affect his decision, regarding engineering work for which he is employed, or which he may be called upon to perform.

## Relations With Engineers

Sec. 19. The engineer will endeavor to protect the engineering profession collectively and individually from misrepresentation and misunderstanding.

Sec. 20. He will take care that credit for engineering work is given to those to whom credit is properly due.

Sec. 21. He will uphold the principle of appropriate and adequate compensation for those engaged in engineering work, including those in subordinate capacities, as being in the public interest and maintaining the standards of the profession.

Sec. 22. He will endeavor to provide opportunity for the professional development and advancement of engineers in his employ.

Sec. 23. He will not directly or indirectly injure the professional reputation, prospects, or practice of another engineer. However, if he considers that an engineer is guilty of unethical, illegal, or unfair practice, he will present the information to the proper authority for action.

Sec. 24. He will exercise due restraint in criticizing another engineer's work in public, recognizing the fact that the engineering societies and the engineering press provide the proper forum for technical discussions and criticism.

Sec. 25. He will not try to supplant another engineer in a particular employment after becoming aware that definite steps have been taken toward the other's employment.

Sec. 26. He will not compete with another engineer on the basis of charges for work by underbidding, through reducing his normal fees after having been informed of the charges named by the other.

Sec. 27. He will not use the advantages of a salaried position to compete unfairly with another engineer.

Sec. 28. He will not become associated in responsibility for work with engineers who do not conform to ethical practices.

From 1540 to 1542, Coronado led his expedition through New Mexico, Arizona and Colorado to the center of Kansas, finding not gold but Indian Pueblos. He returned to Mexico City, "very sad, very weary, completely worn out."



**Coronado**  
was good—  
as far as he went



IN the sunny sagas of Imperial Spain are written the conquests of Coronado—the ceaseless search for the Seven Cities of Cibola, the tireless trek through the Southwest over the same searing sands which today know the purposeful blast of the rocket.

Unfortunately, Coronado had only a single purpose: to cram the coffers of his conquest with gold. Had he raised his sights with an open mind, he might have explored further to discover the lush valleys which lay beyond. But he lacked this flexibility. He stopped too soon.

Today's explorer in the Southwest—particularly in military and industrial electronics—is looking for many answers. He demands product knowledge in both components and instrumentation. This is why more engineers are turning to the Williams organization for the type of "integrated representation" which makes sense. Next time you have a problem, call for a Williams sales engineer. Product knowledge is our chief product.

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# SPACE ELECTRONICS AND TELEMETRY 1960 NATIONAL SYMPOSIUM - Shoreham Hotel, Washington, D.C., Sept. 19-20-21

The Professional Group on Space Electronics and Telemetry will sponsor the fifth National Symposium concerning this important technological field at the Shoreham Hotel in the nation's capitol on September 19, 20 and 21. This year's Symposium will emphasize discussion of new design philosophies and advances in the state-of-the-art.

The program is organized around ten panel type sessions, each directed by a *chairman* prominent in the particular technical field. The panelists and the subject of their papers are selected by the panel chairman, thereby assuring a stimulating content and coherency to each panel area. It is planned to pre-publish the panelists' papers in the Symposium Proceedings and limit paper presentations to their highlights in order to insure sufficient time for inter-panel discussion, questions and audience participation.

The program includes social events; such as the PGSET banquet, cocktail parties, luncheon, hospitality room and ladies' activities. There will also be a large and varied industrial exhibition.

Below is a listing of the panels being presented with respective subjects and chairmen. A complete listing of the individual panelists and the topics they are discussing will appear in the next issue of this magazine.

## MONDAY - SEPTEMBER 19

9:30 - 12:00 A.M.

### Session 1

**Subject:** Telemetry

**Chairman:** Otto A. Hoberg- National Aeronautics and Space Administration, George Marshall Space Flight Center, Huntsville, Alabama

12:00 - 1:30 P.M.

### Session 2

**Subject:** Space Communications  
**Chairman:** Herbert I. Butler-U.S. Army Signal Corps Engineering Laboratory, Fort Monmouth, New Jersey

12:00 - 1:30 P.M.

### Session 3

**Subject:** Electronic Propulsion  
**Chairman:** H. S. Seifert, (ARS), Stanford University, Palo Alto, California

5:30 - 7:00 P.M.

Cocktail party.

## TUESDAY - SEPTEMBER 20

9:30 - 12:00 A.M.

### Session 4

**Subject:** Signal Conditioning

**Chairman:** George Ludwig, State University of Iowa, Iowa City, Iowa

### Session 5

**Subject:** Navigation of Vehicles in Space

**Chairman:** Dr. W. E. Frye, Lockheed Missile System Division, Palo Alto, California

1:30 - 4:30 P.M.

### Session 6

**Subject:** Effects of Space Environment on Men and Equipment

**Chairman:** Major General D. Flickinger, Headquarters Advanced Research and Development Command, Washington, D. C.

### Session 7

**Subject:** Navigation on Earth by Means of Satellites

**Chairman:** Mr. William C. Schofield, Advanced Research Projects Agency, Washington, D. C.

6:30 - 11:00 P.M.

Cocktail party and PGSET banquet.

## WEDNESDAY - SEPTEMBER 21

9:30 - 12:00 A.M.

### Session 8

**Subject:** Propagation

**Chairman:** Mr. J. H. Chisholm, Massachusetts Institute of Technology Lincoln Laboratory, Lexington, Massachusetts

### Session 9

**Subject:** Tracking

**Chairman:** Mr. Francis B. Smith, Headquarters, National Aeronautics and Space Administration, Washington, D. C.

1:30 - 4:30 P.M.

### Session 10

**Subject:** Guidance

**Chairman:** James M. Bridges, Office of Secretary of Defense, Washington, D. C.

## DATES TO REMEMBER

- Aug. 23-26  
WESCON, Ambassador Hotel, Memorial Sports Arena, Los Angeles, Calif.  
LA & SF Sections: WCMEA
- Aug. 29-Sept. 3  
Internatl. Information Theory Meeting, London, England  
PGIT:IEE
- Sept. 7-9  
Joint Automatic Control Conf., M.I.T., Cambridge, Mass. IRE-PGAC:ASME:ISA:AIEE:AIChE
- Sept. 15-16  
8th Annual Eng. Mgt. Conf., Morrison Hotel, Chicago, Ill. PGEM:AIChE:ASME:ASCE:AIEE:AIIE
- Sept. 19-22  
Natl. Symp. on Space Elec. & Telemetry, Shoreham Hotel, Washington, D. C.  
PGSET
- Sept. 21-22  
Industrial Electronics Symp.  
PGIE:AIEE
- Oct. 3-5  
6th Natl. Communications Symp., Hotel Utica & Utica Memorial Auditorium  
PGCS:Rome-Utica Section
- Oct. 10-12  
National Elec. Conference, Chicago, Ill.  
IRE:AIEE EIA:SMPT E
- Oct.  
2nd Natl. Ultrasonics Symp., Boston, Mass. PGUE
- Oct.  
Eng. Writing & Speech Symp., Chicago, Ill.  
PGEWS
- Oct. 19-21  
Symp on Space Navigation, Deshlu-Hilton Hotel, Columbus, Ohio  
PGSET
- Oct. 24-26  
East Coast Aero & Nav. Elec. Conf., Lord Baltimore Hotel, Baltimore, Md.  
PGANE:Baltimore Section
- Oct. 26-28  
Conf. on Magnetic Amplifiers, Bellevue-Stratford Hotel, Philadelphia, Pa.  
AIEE:PGIE
- Oct. 27-29  
1960 Electron Devices Meeting, Shoreham Hotel, Washington, D. C.  
PGED
- Oct. 31-Nov. 1-2  
13th Annual Conf. on Elec. Tech. in Medicine & Biology, Sheraton Park Hotel, Washington, D. C.  
PGME:AIEE:ISA
- Oct. 31-Nov. 1-2  
Radio Fall Meeting, Syracuse Hotel, Syracuse, N. Y.  
IRE:IEA

## NEW CAPE CANAVERAL COMPLEX 36

Construction is under way at the Cape on a launch site for multi-stage space vehicles which will use Atlas as the first stage including Project Mercury and Project Centaur. The complex was designed by Convair Astronautics.

The preliminary work has already started just south of the four existing Atlas flight test complexes at the Cape. The Army Corps of Engineers awarded the construction contracts for the project under direction of the Ballistic Missile Division of ARDC.

The new complex, to be known as "Complex 36", will include a raised concrete pad and ramp, launcher, gantry, service facilities and blockhouse. It will have a gantry 166 feet tall (in contrast to the present complex heights of 115 and 130 feet) to accommodate the extra stages of the rocket and in addition the blockhouse will have two stories instead of the usual one story. Scheduled date for completion is 1960.